Environmental Community Letter

Lawrence Livermore National Laboratory

P.O. Box 808, L-626, Livermore, CA 94551 **NOVEMBER 2000**

1999 Environmental Report shows LLNL operations pose no threat to the public or environment

The Executive Summary in the 1999 Site Annual Environmental Report concludes that radiological doses to the public caused by LLNL operations are about 1.0% of regulatory standards. This is about 2,500 times smaller than the doses received from natural background radiation by U.S. citizens, on average.

The analytical results and evaluations generally show continuing low contaminant levels. This reflects both decreased operations at the Laboratory and its increasing control of pollutants.

Environmental compliance activities in 1999 had significant achievements:

- Livermore site ground water remediation activities treated over 1 billion liters of ground water; reducing the concentration and length of contaminant plumes migrating westward off site.
- Site 300 environmental remediation activities have eliminated the contaminant plumes migrating eastward off site; there is no longer an off-site plume of contaminants.
- Sanitary sewer discharges were 100% compliant with the Livermore Water Reclamation Plant standards.
- The highest median concentration of tritium for samples collected at any air monitoring station was 0.1% at the federal standard. It was 0.0036% for plutonium.

In summary, the 1999 SAER documents that environmental impacts of LLNL operations are minimal.

Specific Monitoring Activities

Air monitored for plutonium, tritium, and other radionuclides

Air is monitored at various locations on the Livermore site, throughout the Livermore Valley, and in the Tracy area. Concentrations of all monitored radionuclides and beryllium at all locations were well below levels that would endanger the environment or public health.

For example, the highest median concentration of plutonium for all sampling locations was 0.0036% of the federal standard. The highest median concentration of tritium for the Livermore Valley was 0.001% of the federal standard. Similar results were found at air sampling locations in areas around Site 300. Federal radioactivity exposure standards are highly protective of the public and limit the annual dose an individual can receive. LLNL has never come close to exceeding the federal standards for the public.

Air effluent monitoring for tritium and radioactive particulates

Throughout 1999, LLNL operated 76 samplers at six facilities to measure any radioactivity in effluent air generated from Lab operations. Radionuclide emissions from all monitored facilities remain very low.

Emissions of nonradioactive hazardous and toxic air pollutants in Laboratory operations in 1999 were low. For example, total nitrogen oxide emission from the Livermore site was approximately 81 kilograms per day. This is about 0.06% of the amount released daily from all sources in the Bay Area. Twenty-four kilograms of reactive organic compounds were emitted per day. This is approximately one five-thousandth of the total Bay Area emission of that pollutant.

Approximately 140 kilograms a day of criteria air pollutants (including nitrogen oxides, volatile organics, sulfur oxides, particulate matter, carbon monoxide, and lead) are emitted per day from the Livermore site and about 6 kilograms are emitted from Site 300. These releases from the LLNL sites are a small fraction of the total daily emissions in the entire Bay Area.

Wastewater monitoring for radioactive and other hazardous materials

The Livermore site discharges 1 million liters of wastewater daily to the City of Livermore sewer system (approximately 4.4% of the total flow to the system). The sewage flow from LLNL to the Livermore Water Reclamation Plant (LWRP) is monitored continuously. If any significant releases of radioactivity, metals, or high or low pH water are detected, the wastewater is redirected to a LLNL sewer diversion system before it leaves the LLNL site. It is then treated and disposed of appropriately.

In 1999, LLNL achieved 100% compliance with LWRP permit limits. The City did not issue any notices of violation, and no sewer releases exceeded discharge limits for radioactive materials.

Water monitoring for radionuclides and other contaminants

The 1999 the maximum tritium activity measured in on and off-site drinking water was less than 0.05% of the regulatory maximum contaminant level (MCL). Gross alpha and gross beta radioactivity measurements were also well below regulatory levels of concern.

In the Livermore Valley, no monitored radioactive or inorganic nonradioactive constituent was found to exceed primary drinking water MCLs in any off-site well. In on-site wells, chromium and nitrates have been detected above the primary MCL, but these constituents have not migrated off site at levels above the primary MCLs. The shallow ground water beneath Site 300 contains volatile organic compounds (VOCs), tritium, nitrate, Freon, perchlorate, and depleted uranium. These present no current health risks because the shallow ground water is not used as a source of supply.

Soil and sediment monitored for plutonium and other radionuclides

Most of the analyses of 1999 on-site soil samples did not detect any nonradiological contaminants labeled as "constituents of concern." A few analyses detected either trace amounts of contaminants, or naturally occurring background concentrations. Radiological results were unchanged from previous years. Elevated concentrations of depleted uranium were found near two Site 300 firing tables.

All soil samples taken in the City of Livermore's Big Trees Park in 1998 yielded results well below levels of regulatory concern. A January 2000 report by the Agency for Toxic Substances and Disease Registry (ATSDR) confirmed these results.

The ATSDR report finds that the most credible source of the plutonium in the park is from sewage sludge applied to ornamental trees several decades ago. The source of the plutonium was LLNL releases to the Livermore sanitary sewer in the 1960s.

Vegetation and foodstuff monitoring for tritium

In general, monitoring showed values not significantly different from the past few years.

As usual, there was slightly more tritium near the Livermore site than was found at more distant locations. Potential ingestion dose estimates were well below levels of regulatory concern, even when organically bound tritium was taken into account.

Ground Water Remediation

In 1999, treatment facilities at the LLNL Livermore site processed over 1 billion liters of ground water. Nearly 270 kilograms of volatile organic compounds (VOCs) were removed during treatment.

More than 39 kilograms of VOCs were removed from soil and ground water in five treatment areas at Site 300. These efforts reduced the length of the previously off-site trichloroethylene plume to where it is now inside the site boundary. There is no longer an off-site plume of contamination.

Waste Minimization and Pollution Prevention

Waste generation at LLNL continues to drop dramatically. There were reductions in three categories: radioactive, hazardous, and sanitary. Mixed waste (radioactive and hazardous waste combined) did not diminish. Total LLNL waste diverted from landfills in 1999 was 47,000 tons. That means the lab recycled 89% of its nonhazardous waste.

Radiological Dose Assessment

Every year a theoretical dose to the public is calculated based upon what an individual would receive if he/she lived for a year where the highest radiation dose would occur. For the Livermore site that dose is 0.12 millirem. For Site 300, it is 0.035 millirem. These values are well within those estimated over the past decade and are very small compared with radioactive dose from natural background sources.

Radiation and You

Sometimes reports like the SAER raise questions about topics that may not be well understood (such as the environment we live in being radioactive). Here is some information about radiation.

What Is Radiation?

Radiation can be either ionizing or nonionizing. Nonionizing radiation includes laser light, radar, and microwaves.

The type of radiation most people refer to when they use the word 'radiation' is ionizing radiation—invisible particles or waves of energy emitted from radioactive atoms or radiation-generating devices such as x-ray machines.

The common types of ionizing radiation are alpha, beta, neutron, x-ray, and gamma radiation.

Radiation is invisible energy emitted from unstable (radioactive) atoms. Atoms that are unstable have too much energy in their nucleus. Most systems found in nature try to reach the lowest energy state possible. Radioactive atoms do so by emitting radiation (i.e., 'decaying') until they become stable. This can take from fractions of a second to billions of years.

If radiation energy is deposited in a person, he or she receives a radiation dose.

Radiation doses are measured in units of millirem (mrem) or rem. One thousand millirem is equal to one rem (1000 mrem = 1 rem).

Background radiation is radiation from our natural environment. It primarily comes from cosmic rays, radioactive material in the earth, ingestion of naturally occurring radioactive material in food (such as potassium-40), and inhalation of radon gas.

In the United States, the average background radiation dose to individuals is 300 mrem/year.

Manufactured sources of radiation contribute an additional dose of approximately 60 mrem/year. Of this dose, about 54 mrem/year is from medical procedures (e.g., x-rays and certain diagnostic tests). Consumer products, such as lantern mantles and smoke detectors, contribute roughly 5 mrem/year.

Radiation from past above-ground nuclear weapon tests that is still present in our environment contributes less than 1 mrem/year.

What are the Risks from Radiation Exposure?

The primary risk from exposure to ionizing radiation is an increased risk of cancer.

The amount of risk depends on the amount of radiation dose received, the time over which the dose is received, and the body parts exposed.

Although scientists assume low-level radiation doses increase your risk of cancer, medical studies have not demonstrated adverse health effects in individuals exposed to small radiation doses (i.e., up to 10,000 mrem above background).

The increased risk of cancer from occupational radiation exposure is small when compared to the normal cancer rate in today's society. The current risk of dying from all types of cancer in the United States is approximately 20 percent.

Over a 70-year lifetime, the average US citizen will receive about 21,000 mrem from background radiation and another 4,000 mrem from other sources (primarily medical exposures).

If a person receives an additional whole-body radiation dose of 25,000 mrem over the course of a lifetime, his or her risk of dying from cancer is presumed to increase 1%, to 21%.

Heritable effects (i.e., effects seen in offspring) have not been observed in humans exposed to radiation (e.g., the atomic bomb survivors).

The limit for occupational exposure to radiation is 5,000 mrem/y. The vast majority of LLNL workers (>98%) do not receive any occupational exposure.

Of the approximately 150 workers who do receive occupational exposure, the doses are kept as low as reasonably achievable through the use of engineered and administrative controls. For example, in 1999, less than 150 people received occupational exposures; only 7 people received more than 500 mrem; and no one received more than 1,200 mrem.

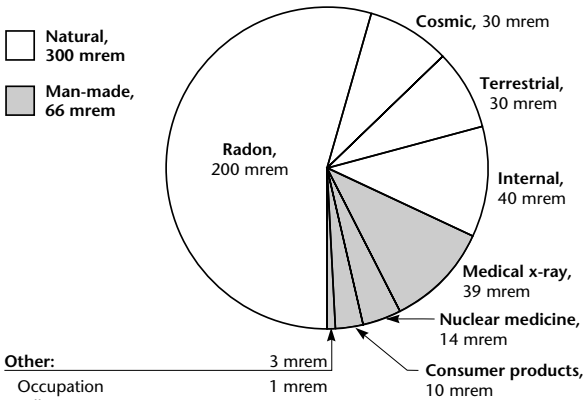
continued on page 4

continued from page 3

The limit for exposure to the public from industrial sources of radiation is 100 mrem/year. In 1999, the exposure rate at the LLNL fence line was less than 1% of this value (i.e., less than 1 mrem/y). People living in surrounding areas do not receive any measurable dose of radiation from LLNL operations.

More about radiation and radiation exposure may be found on our web site (www-envirinfo.llnl.gov/) or those of the U.S. Environmental Protection Agency (www.epa.gov) or U.S. Nuclear Regulatory Commission (www.nrc.gov.) where you can compute your own radiation exposure. Also very helpful is the web site of the Health Physics Society (www.hps.org).

Radioactive contamination is radioactive material in a location where it is not wanted. Not all contamination is harmful to humans. Contamination must result in a dose that causes health effects to be harmful. Harm to the public from radioactive contamination is extraordinarily rare in the United States and most other nations.



Other:	3 mrem
Occupation	1 mrem
Fallout	1.1 mrem
Nuclear fuel cycle	0.4 mrem
Miscellaneous	0.4 mrem
LLNL 1999 operations (most exposed public individual)	
Livermore site	*0.10 mrem*
Site 300	*0.035 mrem*

Typical annual radiation doses from natural and man-made sources (National Council on Radiation Protection 1987b).

www-envirinfo.llnl.gov/

Visit this website for information about LLNL environmental news and data, including meeting announcements, public notices, reports, and details of studies.

Why do a Site Annual Environmental Report? And how do I get one?

Each year Lawrence Livermore Laboratory (LLNL) is required to produce hundreds of different reports for the agencies in charge of regulating the Lab. A few such agencies charged with protecting public health and the environment are the U.S. Environmental Protection Agency, regional air and water boards, and the California Department of Toxic Substances Control.

These agencies, as well as the U.S. Department of Energy (DOE) and the University of California, which manages the Laboratory for DOE, oversee Lab operations and monitor any impacts that LLNL operations may have on the public or the environment.

The DOE requires each DOE facility to publish an annual report that summarizes its regulatory compliance status as well as report the results of environmental monitoring done during the year. The 1999 Site Annual Environmental Report (SAER) is the LLNL response to DOE's requirement. This document represents the collection of over 13,000 environmental monitoring samples from the air, water, vegetation, and soil surrounding the LLNL site and Site 300 and the assessment of over 250,000 different characteristics from these samples. Some ground water samples may be tested to determine the amount of as many as 19 different compounds. All the data collected, collated, and reviewed, and the related modeling, analysis, and conclusions are presented annually not only to regulatory agencies but are also shared with the public through the SAER. You will find volumes of the 1999 SAER in the LLNL Environmental Repositories at the Livermore and Tracy libraries and the LLNL Visitors Center. The documents are also available on the Web at:
http://www-envirinfo.llnl.gov/

This letter features an abbreviated version of the Executive Summary from the 1999 SAER. The complete document is available by calling me…

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This work was performed under the auspices of the U.S. Department of Energy by University of California Lawrence Livermore National Laboratory under Contract W-7405-ENG-48. UCRL-AR-112812-00-1

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